

STORIES BY CONNIE BRYSON

FOCUS

During the past ten years, Alberta has emerged as a major player on the international medical research scene. The province's medical scientists and doctors are making their mark with groundbreaking research on breast cancer, arrhythmias, diabetes, and gastrointestinal diseases, to name only a few areas.

"Everywhere I go, my colleagues in medical science know about Alberta," says Dr. Joe Martin, Harvard University neurology professor and chief of neurology at Massachusetts General Hospital, Boston.

"The excellence of the researchers and the quality of their work has given a visibility to the universities in Edmonton and Calgary that doesn't exist for many other Canadian universities," adds Martin, who is a graduate of the University of Alberta and a member of the Scientific Advisory Council of the Alberta Heritage Foundation for Medical Research.

But world-class research is more than a feather in Alberta's cap. It translates directly into high-quality, state-of-the-art patient care.

"It's important to realize that the benefits of medical research need not only be measured in terms of how life is going to be better for our grandchildren," explains Dr. Mark Poznansky, associate dean of medicine (research), University of Calgary. "Here in Alberta, medical research has immediate consequences — the best physicians, using the latest techniques and medicines, are treating patients right now.

"If we didn't have this strong research base, the level of medical care in Alberta would lag about five or six years behind the major research centres."

Dr. Jean-Michel Turc, executive director of the Alberta Cancer Board, echoes Poznansky's thoughts. He says that quality care for cancer patients cannot exist without research.

"Cancer therapies are in constant evolution — we don't treat the disease now the same way we did a year ago. If we didn't do cancer research in Alberta, patients wouldn't have the same access to new methods of diagnosis and new therapies. We'd be years behind.

"Cancer is arguably the most traumatic experience in a person's life. To ask a cancer patient to leave the province for treatment just doesn't make any sense. Our approach is to try to deliver cancer care as close to patients' homes as possible because this is where they will get the best support. We're looking at the whole person."

The budget for cancer research in the province is now over \$6 million per year. There are 90,000 cancer patients alive in Alberta; about 12,000 new cases are reported every year.

"If research can reduce the number of new patients by even one per cent, that is a significant achievement," says Turc. "We aim to move the results of research from the laboratory bench to the bedside as quickly as we can."

The flow of knowledge is facilitated by the tightly knit medical research network in Alberta. Excellent working relationships and cooperation among the universities, hospitals and cancer centres ensure that advances

in biomedical knowledge and biotechnology are transferred quickly to patients.

In 1979, medical research in Alberta gained international prominence with the establishment of the Alberta Heritage Foundation for Medical Research (see separate story). The foundation's \$300-million endowment is an investment in knowledge and brain power; it has allowed Alberta's universities and hospitals to attract top medical research scientists from around the world. As of January 1989, the foundation had contributed \$275 million to medical research, more money per capita than any other province, state, or country in the world.

"As a direct result of the foundation, Alberta is in an exceptional position to attract the best people and give them the best technology to study problems," says Dr. Cy Frank, a University of Calgary ligament researcher and arthroscopic surgeon at Calgary's Foothills Hospital. "Without the foundation, we'd be years behind in medical research."

Heritage Foundation funding has been a boon to university research, attracting world-renowned scientists to Alberta. In turn, these scientists have attracted additional research funds from other sources. Based on funding for medical research, the medical schools at the universities of Alberta and Calgary now rank in the top five in Canada. Ten years ago, they weren't in the top ten.

As a result of the new research orientation in the province's medical schools, graduates are better able to manage the scientific method and are tuned in to advances in research.

"If a medical program is devoid of research, young people go elsewhere," says Dr. Lionel McLeod, president of the Alberta Heritage Foundation for Medical Research. "We've recognized that this would be a terrible loss of our greatest resource. With an emphasis on research, we're able to keep our bright young minds here and attract others. We've created a community of medical researchers."

This extensive biomedical research base and associated technology transfer activity have spawned a new research-related industry in the province (see separate story). Many of the innovations coming out of research labs have been patented; others are already on the market.

The private sector, attracted by leading researchers, has increased its involvement with Alberta's universities. For example, in 1983 private sector contracts with medical researchers at the University of Alberta totalled \$250,000; in 1988-89 the sum was \$3.2 million.

The third partner in the equation is the Alberta government. Having put Alberta on the medical research map with the establishment of the foundation, the government is committed for the long run.

"We know that major medical advances require years of research with uninterrupted support, and our government is committed to providing the right environment for this to happen," says Technology, Research and Telecommunications Minister Fred Stewart.

"We will continue to build our partnership with the research community and industry to ensure that medical breakthroughs translate as quickly as possible into better health care and a more diversified economy for the benefit of all Albertans."

ON MEDICAL RESEARCH

FOUNDATION SPARKS MEDICAL EXCELLENCE

If medical researchers had a magic lantern, this would be it

The basic ingredients for a successful research program sound simple enough — money, time and people. Yet all three are very hard to find.

First of all, money is scarce. Universities, hospitals, and granting agencies have limited budgets and many research programs require a great deal of money.

Researchers also need time to carry out their work; unfortunately, the teaching and administrative loads at universities can be such that only a small percentage of time is left for research. Finally, highly trained and qualified researchers must be hired to do the research. Without adequate funding and protected time for research, recruitment is next to impossible.

Enter the Alberta Heritage Foundation for Medical Research in 1979. Created on the strength of advice from the medical schools and the vision of the premier at the time, Peter Lougheed, the foundation set about using its \$300-million endowment to support "a balanced, long-term program of medical

research based in Alberta."

Since 1980, the foundation has recruited more than 145 senior scientists from throughout North America, Europe, Asia, Australia and New Zealand. These world-class researchers have been attracted by generous funding, protected time for research, relative freedom to pursue their ideas, and a growing community of energetic young people and esteemed senior investigators.

"The foundation is unique; it wasn't modelled after an existing institution," says Dr. Lionel McLeod, foundation president. "It is a bold attempt to drastically increase the quality of Alberta's medical research community."

The experiment has been an unqualified success. Since 1980 the foundation has contributed over \$275 million to the scientific community. From 1984 to 1989, the annual scientific budget averaged \$37.3 million. (This figure does not include \$54.8 million spent on two new research buildings in Edmonton and Calgary.)

"The foundation has put Alberta on the research map," says Dr. Joe Martin, Harvard University neurology professor and chief of neurology, Massachusetts General Hospital. "There are options and opportunities available here that simply aren't present anywhere else. The possibilities are tremendous for medical scientists who come to Alberta."

The foundation operates at arm's length from the Alberta government; its direction has been strongly influenced by the scientific community. An international Scientific Advisory Council advises the foundation on major applications and general policies to ensure programs meet international standards of scientific excellence. Every six years, the work of the foundation is reviewed by an International Board of Review.

Scientists funded by the foundation work at the universities of Alberta and Calgary, and their affiliated institutions. Internationally recognized scientists are recruited and generously funded to build research groups. Researchers contribute to teaching and patient care,

with 75 per cent of their time protected for research.

Funding from the foundation helped the University of Calgary recruit hearing specialist Dr. Jos Eggermont from the Netherlands three years ago. Within two years of his arrival, Eggermont had a sophisticated lab up and running. If it hadn't been for the generous establishment and start-up grants from the foundation, Eggermont says set-up time would have been at least twice as long.

"But funding is just one thing," he says. "The first five years are critical to getting a laboratory going. You simply can't do it well if you're loaded with teaching and administrative responsibilities. The protected time for research is what's really important. If it hadn't been for the offer of time, I never would have come here."

Foundation president McLeod notes that attractions of doing research in Alberta have changed with time. "At the outset, our equipment and start-up grants meant we could compete with the rest of the world and attract outstanding researchers," he says. "Now these researchers have become attractions in themselves. People are coming to Alberta just so they can work in our research groups."

Harvard's Martin agrees. "The foundation has really turned things around," he says. "It is a spark around which a flame is growing."

McLeod is not content to let the fire burn untended. "Our job at the foundation is to ensure the continuing rejuvenation of our medical research teams," he says. "We encourage our bright young people to become researchers through studentships and fellowships. We can't walk away. The network must be continually fed."

"We're always aware that what happens in Alberta is part of what happens in Canada. If we don't maintain the quality of our programs, other governments will say our experiment didn't work. We are a symbol of quality and we're committed to keeping it that way."



Dr. Lionel McLeod: "We are a symbol of quality and we're committed to keeping it that way."

LIGAMENT TRANSPLANTS ON HORIZON

Doctor's research is driven by clinical needs

For Heritage Medical Scholar Dr. Cy Frank, scientific research and clinical treatment are two sides of the same coin. As an arthroscopic surgeon at Calgary's Foothills Hospital and a ligament researcher at the University of Calgary, Frank handles tough cases at the bedside and in the laboratory.

"My clinical work reinforces on a daily basis why we need research," Frank says. "I'm constantly confronted with problems that are not solvable optimally with the procedures that are available today. All my work, either

directly or indirectly, is aimed at solving these clinical problems."

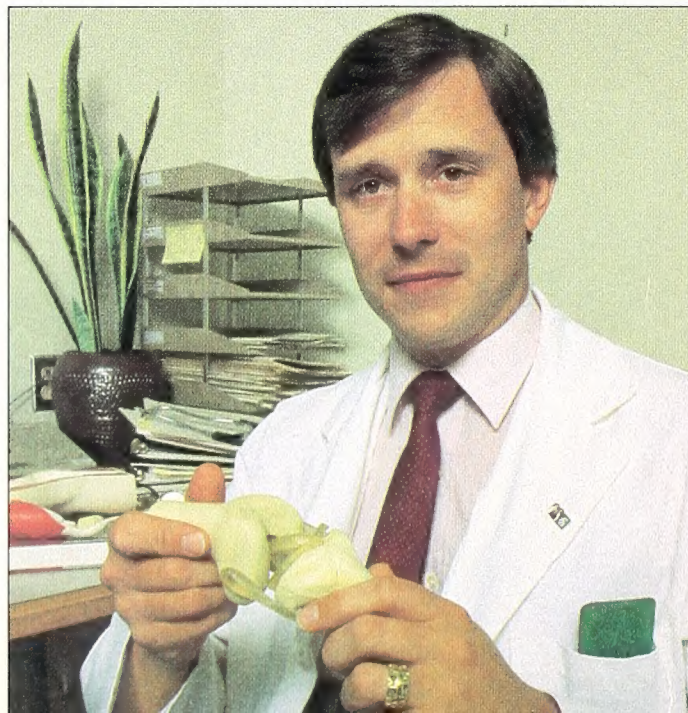
Frank and postdoctoral fellow Dr. Paul Sabiston are studying ligament transplantation. "There are thousands of people with deficient joints who must limit their activities because there is no remedy at present," says Frank. "The promise of transplantation gives new hope to a lot of people who have given up sport as a result of ligament injuries."

As an outgrowth of his ligament research, Frank is now part of a newly formed research group investigating the

causes and prevention of arthritis.

"This group wouldn't have come about if it hadn't been for the Heritage Foundation," says Frank. "We have

excellent facilities in the Heritage Medical Research Building and the ability to attract top-quality researchers. These are exciting times to be in Alberta."



Dr. Cy Frank: all his work is aimed at solving clinical problems.

MOVING TO MARKET

Program boosts Alberta's economy by developing new ideas locally

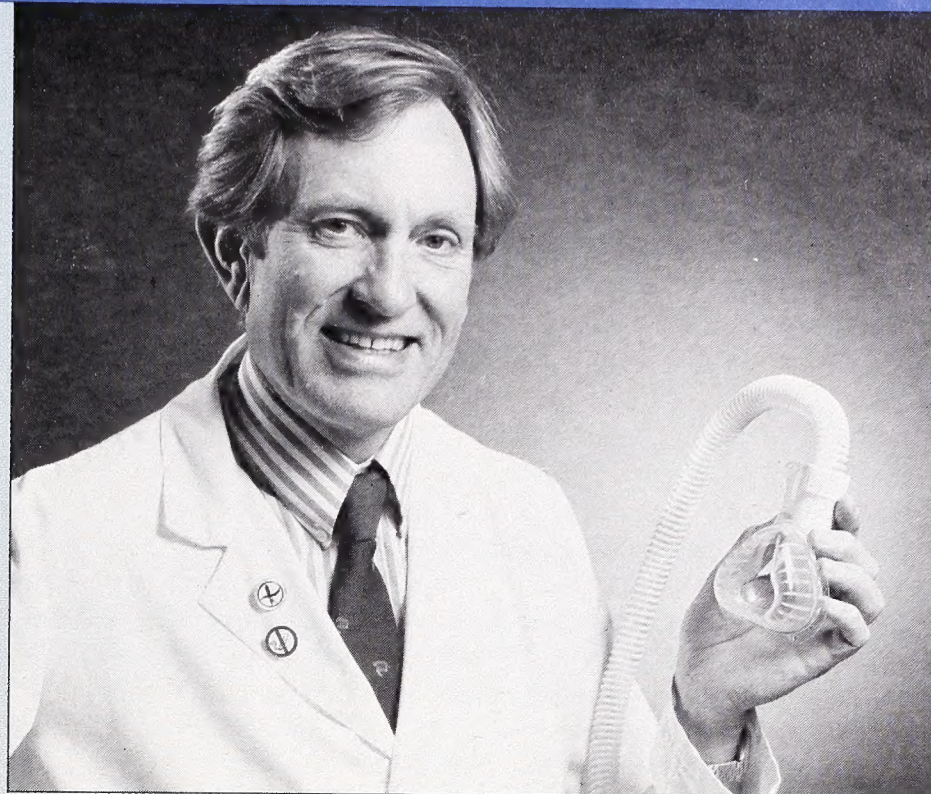
"Technology transfer" may have attained the status of buzz word, but to the president of the Alberta Heritage Foundation for Medical Research the phrase has a very real meaning — improved patient care and a boost to Alberta's economy.

"The spin-offs from research have immediate benefits for patients, all the way from protecting hospital patients from Legionnaires' Disease to the development of advanced lasers for endoscopic surgery," says Dr. Lionel McLeod.

"On top of this, the local development of medical research innovations is one way to diversify the provincial economy. Wherever possible, the foundation strongly encourages development, manufacture and marketing in Alberta."

The foundation established its Technology Transfer Program in 1986 at a time when there were no other ways of financing commercialization of new ideas.

The program provides seed capital for the development of promising scientific ideas to the stage where additional investment capital can be attracted. Phase I grants allow for the quick exploration of an idea for its commer-



Dr. John Remmers: his Tranquility apparatus treats sufferers of sleep apnea.

cial value; Phase II grants fund further development. The grants are available to scientists or engineers working in either universities or private Alberta-based companies.

One of the most exciting projects funded by the Technology Transfer Program is Tranquility, a sleeping apparatus used to treat sufferers of sleep apnea. This debilitating and sometimes fatal condition is caused by a blockage in the upper airway. While asleep, sufferers momentarily stop breathing hundreds of times during the night.

University of Calgary Heritage Medical Scientist Dr. John Remmers developed the Tranquility system. A Phase II grant supported development

and initial testing of the device. Healthdyne Corporation, an Atlanta-based firm specializing in home respiratory care, entered into a licensure agreement with the University of Calgary and is now marketing the system.

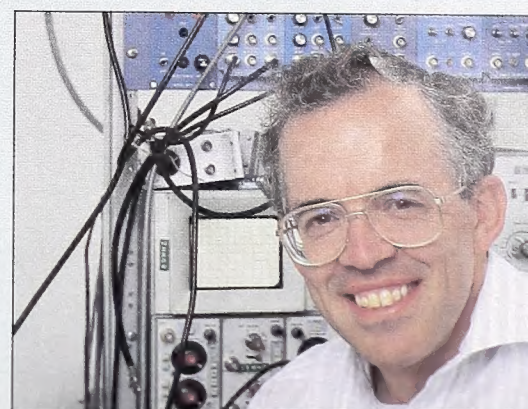
In another research area, University of Alberta scientist Dr. Richard Stein has received both Phase I and II grants to develop a sophisticated prosthesis which acts much like a natural leg. It allows amputees to climb stairs or walk on uneven surfaces.

"I'm committed to the idea that if the results of research will be useful to the public, the private sector must be involved," says Stein. "But private firms aren't keen on products such as our

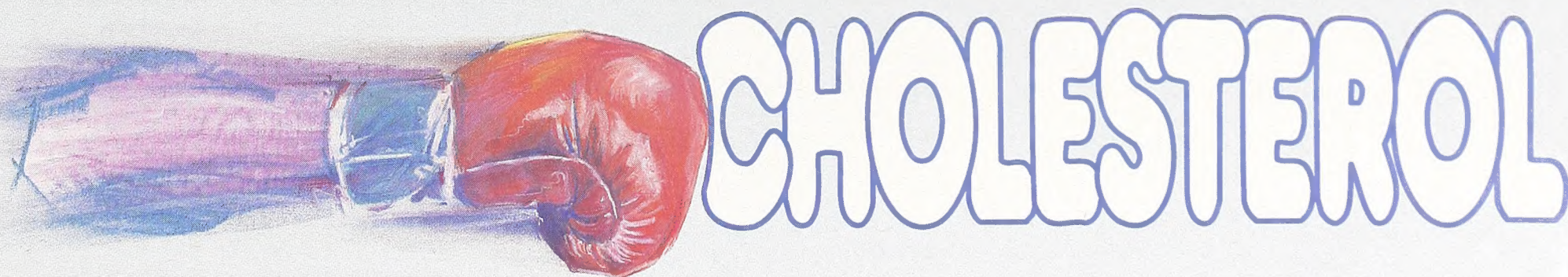
prosthesis until they are sure the product has gone beyond a laboratory prototype to something with potential for commercialization. The bridging funds we received from the foundation have allowed us to take these extra steps."

The latest addition to the foundation's technology transfer activities is the Medical Innovation Plan. Using money given to Alberta Technology, Research and Telecommunications from the federal government, the new program supports Phase III technology transfer grants for projects that need more intensive development to attract venture capital. Grants include industry-based post-doctoral fellowships, positions for business school graduates in small companies, and support for clinical trial design, biostatistics and clinical epidemiology.

"This provides a whole new opportunity for applied research in Alberta," says McLeod.



Dr. Richard Stein: "If the results of research will be useful to the public, the private sector must be involved."



TAKING ON THE BIG, BAD GUY

U of A group's breakthrough could help in lowering blood cholesterol

Cholesterol is a well-known bad guy. In fact, worry over cholesterol levels is enough to make even the contemplation of a fried egg seem naughty. The concern is justified: excess cholesterol in the blood causes coronary artery disease, or atherosclerosis, leading to heart attacks and strokes which kill 80,000 Canadians every year.

But although we know it's bad, just how cholesterol is involved in heart disease is still unclear. This understanding is key to improved therapy and prevention of atherosclerosis. It's the focus of the University of Alberta's Lipid and Lipoprotein Group.

Five-year funding of \$3.6 million from the Alberta Heritage Foundation for Medical Research has made it possible to recruit internationally renowned cholesterol scientists from around the world. Dr. Dennis Vance heads the research team.

"The group concept is a definite attraction," Vance explains. "We can

share research interests and common techniques. It's also easier to develop new techniques in this environment. Criticism of each other's experiments is the best way to improve our work and ensure that it's the best it can be. There's a synergy here that you can't get working individually."

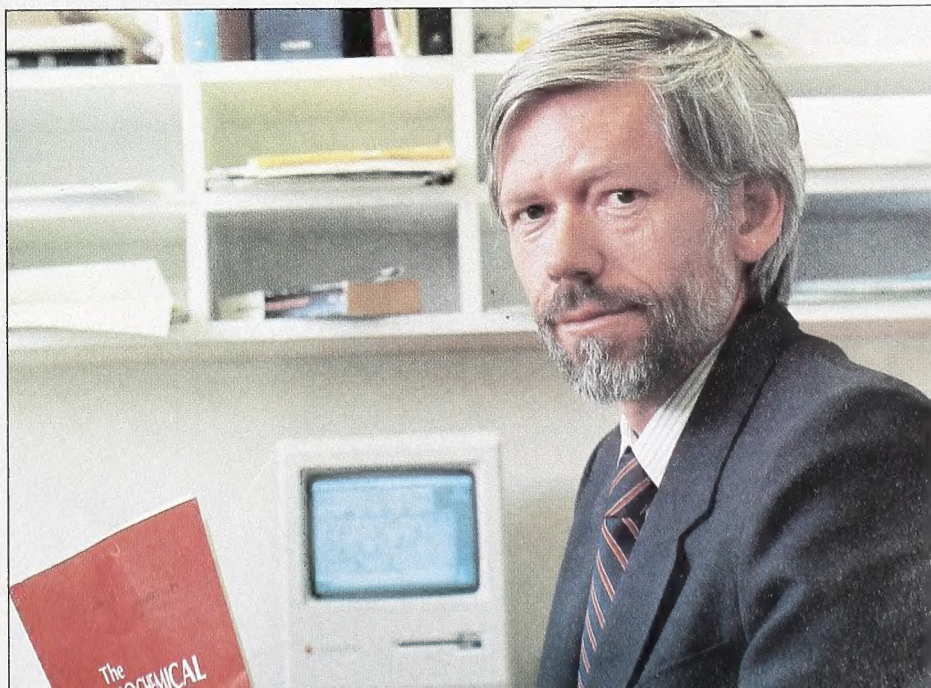
That's not to say that each scientist

in the Lipid and Lipoprotein Group works on the same research topic. Everyone has a unique approach to the research. Topics include the relationship of stress to lipid metabolism, experimental treatments to control cholesterol levels, and the transportation of lipids in the bloodstream.

Last year, Vance's lab recorded a major breakthrough with the purification of a liver enzyme involved in the synthesis of a substance called phosphatidylcholine (PC). PC is needed to carry the cholesterol made in the liver to the bloodstream.

"The significance of purifying the enzyme is twofold," Vance explains. "It has advanced our basic knowledge of the biochemistry of cholesterol and also ties into work on cholesterol metabolism. Controlling PC synthesis could be a new approach to lowering blood cholesterol."

Dr. Dennis Vance: "There's a synergy here that you can't get working individually."



DETECTING HEARING LOSS IN KIDS

Early diagnosis could reduce long-term effects



Earlier diagnosis of hearing loss in children is the promise of work done by University of Calgary Heritage Medical Scholar Dr. Jos Eggermont. Hearing loss at an early age often has long-term effects. It can delay the acquisition of spoken language, an effect which Eggermont says can still be measured at the end of junior high school.

In an extensive study of children at the Foothills and Alberta Children's Hospitals, Eggermont's research team found that the brain's response to middle frequency noises develops fastest, with the response to both lower and higher frequencies lagging behind. Eggermont says these results show that differing responses should be taken into account in diagnostic tests.

"The parts of the ear that are least developed are the most susceptible to damage," he explains. "As a result, a lot of hearing loss in infants occurs in the high frequencies because this response is least developed."



Dr. Jos Eggermont: tests should be done at all frequencies.

"But 99 per cent of all hearing tests are not specific for frequency. As a result we're never on top of where damage can occur. Our work shows that tests should be done at all frequencies. This would spot the early stages of hearing loss which conventional tests can miss. If we detect these problems earlier, we can also design earlier and more effective therapies."

"Then we'll be able to reduce the severity of long-term effects of hearing loss."



AFFAIR OF THE HEART

Improved implants drastically reduce recurrence of heart attacks

Dr. Frank Witkowski sees cardiac research as a logical spin-off of his "first life." He's referring to being an electrical engineer, his first career before attending medical school and specializing in cardiology.

"Sudden cardiac death is an electrical accident," explains Witkowski. "Something goes wrong with the electrical currents that signal the heart to pump. No electricity, no pump."

About 300,000 North Americans die of sudden cardiac death each year. The common mode of death is ventricular fibrillation — the heart goes crazy with fast and irregular rhythms. Treatment usually entails defibrillation by passing a large electrical current through the heart. On television and in movies this procedure is most often successful; in real life, it sometimes works and sometimes doesn't.

Witkowski believes that a better understanding of how defibrillation works is the key to improved therapy. His research requires high-speed computers and state-of-the-art electronic equipment, most of which must be custom-made. Witkowski says the only place he could find funding for such a

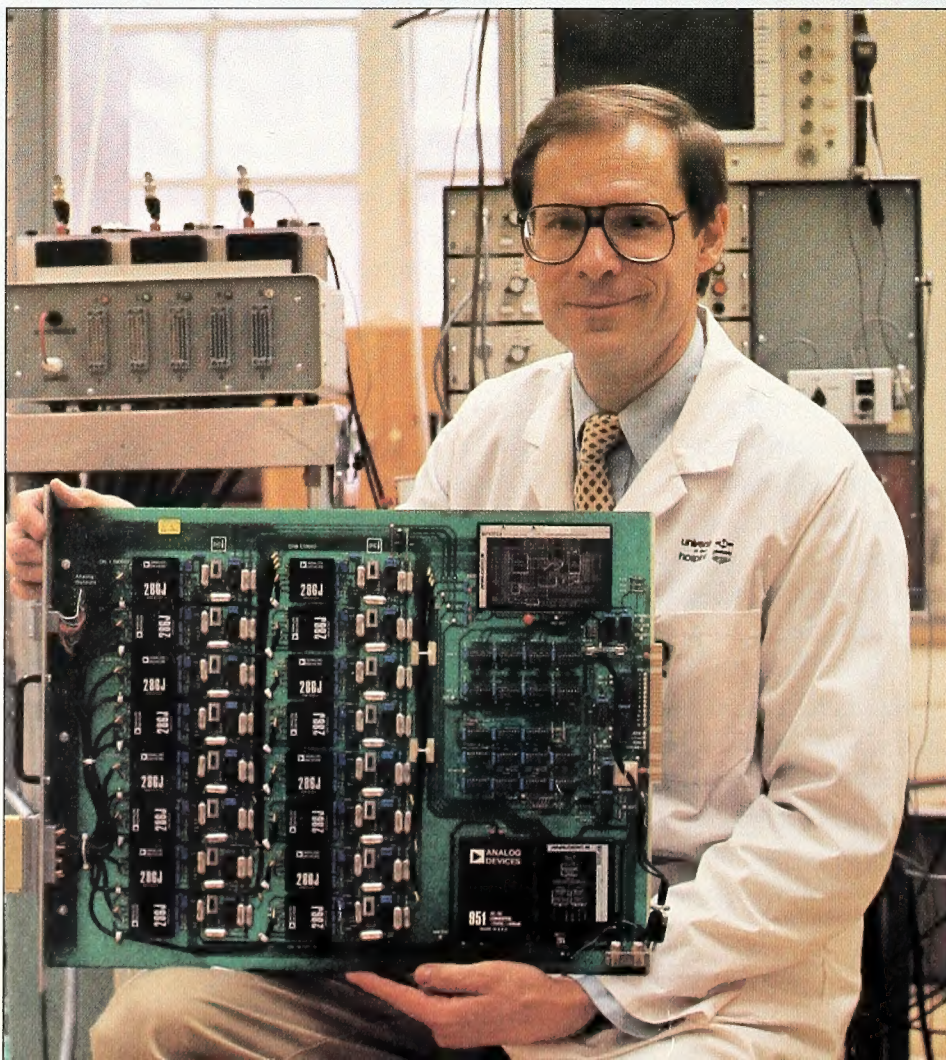
venture was in Alberta.

"Most universities can come up with start-up funds on the order of \$100,000, but I needed a half million," he says. "That's normally the kind of funding that only pre-Nobel Prize winners can command. But the Heritage Foundation put its faith in me. It's a gamble but I believe it's going to pay off."

In fact, the pay-offs are already in sight. The most immediate application of Witkowski's work is the improve-

ment of new implantable defibrillators. Although effective — they reduce the 30-per-cent chance of heart attack recurrence and death to three or four per cent — they are expensive and bulky.

"There aren't many treatments in medicine that so dramatically improve the patient's chances for survival," says Witkowski. "Understanding defibrillation will result in smaller and less expensive devices, and in their widespread use."



Dr. Frank Witkowski: pay-offs are already in sight.